

## Amendments

Because public concerns, values, and demands change over time, the Board must be flexible and responsive to changing circumstances. Therefore, the Comprehensive State Water Plan must be reevaluated over time, and adjusted as needed.

The Board will amend the Comprehensive State Water Plan when it determines that revisions are in the public interest. The Board will consider proposals for amendment to the plan from private parties as well as state agencies. In the event the Board determines that a proposal will not substantially impair the values which were the basis of a protected river designation, the Board shall follow the public hearing process and procedures required for the adoption of the original plan (Idaho Code Sections 42-1734A and B). The Board shall determine whether or not to amend the plan after weighing the impact the uses allowed by the proposed amendment would have on the other uses and values which were the basis of the original action or recommendation. In addition, the Board shall review and reevaluate the Comprehensive State Water Plan at least every five years (42-1734B(7)). All amendments to the state water plan shall be submitted for review and possible amendment by the Idaho Legislature as required by law (42-1734B).

### III. SCREENING FOR OUTSTANDING VALUES

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Fish, wildlife, recreation, scenic and geological resources, pursuant to Idaho Code 42-1731(7) and (9), were identified and evaluated for the Middle Snake reach. This evaluation or "screening" considered the uniqueness, rarity or significance of the resource from a national, regional, and/or local perspective; the degree of protection accorded the resource through statute, regulation, rules, or agency management policy; and the potential for resource impact or opportunity to mitigate. River segments with at least one "Outstanding" evaluation for fish, wildlife, recreation, geologic or scenic values were judged eligible for consideration as possible state protected rivers. Resource attribute categories are based on the following general criteria:

*Value of the Resource:* The uniqueness, rarity or significance from a national, regional and/or local perspective, including the level of public concern.

*Regulation or Agency Policy:* The degree of protection accorded the resource through statute, regulation, rules, or agency management policy.

Detailed inventories are provided in Appendix C: Screening for Outstanding Values.

## Scenic Values

The objective of the scenic evaluation was to determine the distinctiveness or scenic quality of landscape settings. The evaluation was conducted from November 1991 to September 1992. Data collection for the scenic value study involved review of visual resource inventory information available from other agencies, and photographic documentation of visual landscapes in the Middle Snake reach.

The planning area was previously inventoried for visual resource values by three Bureau of Land Management (BLM) Districts (Boise, Burley and Shoshone) as part of their resource management plans. Guidance for inventorying BLM lands for visual resource values is found in the *Visual Resource Management Inventory and Contrast Rating Manual - 8400 Series* (VRM manual), originally published in 1980 with revisions in 1984 and 1986 (U.S. BLM, 1986). Review of the visual inventory data available from the three BLM districts located in the planning area revealed differences in inventory dates, quantity of available data, and study scales. All districts had VRM class data mapped, but scenic quality classes were only available from one district. Given the varying inventory periods and differences in types of available data, it was determined that IDWR needed to conduct an independent evaluation.

IDWR conducted a scenic distinction evaluation to derive current data at a scale consistent with the planning area. The scenic distinction evaluation involved two steps: (1) defining visual unit boundaries, and (2) evaluating the scenic distinction or scenic quality of each visual unit. Visual unit boundaries were determined through extensive field reconnaissance and photographic documentation. Boundaries were mapped on U.S. Geological Survey 7.5 minute quadrangles and then field checked to verify accuracy. Forms were completed in the field and through review of photographic documentation recording landform, vegetation, water character, cultural modifications and other visual characteristics for each unit.

Scenic distinction ratings were determined using the BLM's scenic quality model described in the agency's VRM manual for each of the 28 visual units identified in the Middle Snake reach. The numerical ranking system for determining scenic distinction has a maximum of 32 points. Those landscapes with "Outstanding" or distinctive scenic values received scores of 32 to 19. Landscapes considered above average, but not outstanding, received scores of 18 to 12 and were rated "High" for scenic distinction. Landscapes with little visual variety received a score of 11 or less and were rated "Moderate to Low" for scenic distinction. Visual sensitivity levels and distance zones were not evaluated or delineated in this study.

## Scenic Values Evaluation for Middle Snake Reach

| SCENIC DISTINCTION CATEGORY | CRITERIA  | MIDDLE SNAKE REACH  |
|-----------------------------|---|---|
| Outstanding                 | <p>Landscapes with significant variety in landscape features; and/or possessing distinctive or unique features (received a score of 32 to 19)</p> <p>Landscapes with vertical or steep canyon walls, strong enclosure and immense scale; variety in water forms characterized by whitewater, falls, and numerous springs; variety in vegetation pattern, texture and color with contrasts introduced by wetlands, riparian and spring-associated vegetation; cultural modifications add visual variety and are generally harmonious to the visual unit as a whole</p> | <p><i>Milner Bridge to Bickel Springs (near Gridley-Hwy 30 Bridge)</i></p> <p><i>Bliss Dam to Little Pilgrim Gulch</i></p> <p><i>Bancroft Springs area</i></p>                              |
| High                        | <p>Landscapes which provide above average variety in landscape features (received a score of 12 to 18)</p> <p>Areas where canyon is defined by dissected hills or canyon walls which are less vertical, enclosure and scale are not as distinct; whitewater is lacking or minimal; some variety in vegetation patterns and types; cultural modifications add little or no visual variety to landscape</p>   | <p><i>Bickel Springs (near Gridley-Hwy 30 Bridge) to backwaters of Bliss Reservoir</i></p> <p><i>Little Pilgrim Gulch to Bancroft Springs</i></p> <p><i>I-84 Bridge to Clover Creek</i></p> |
| Moderate to Low             | <p>Landscapes where characteristic features possess little variety (received a score of 11 or less)</p> <p>Areas where canyon walls are characterized by moderate to low hills; minimal variety in vegetation, usually one type</p>   | <p><i>Backwaters of Bliss Reservoir to Bliss Dam (Bliss Reservoir)</i></p> <p><i>I-84 Bridge vicinity</i></p> <p><i>Milner Dam to Milner Bridge</i></p>                                     |

# SCENIC VALUE INVENTORY / EVALUATION

## Middle Snake Reach

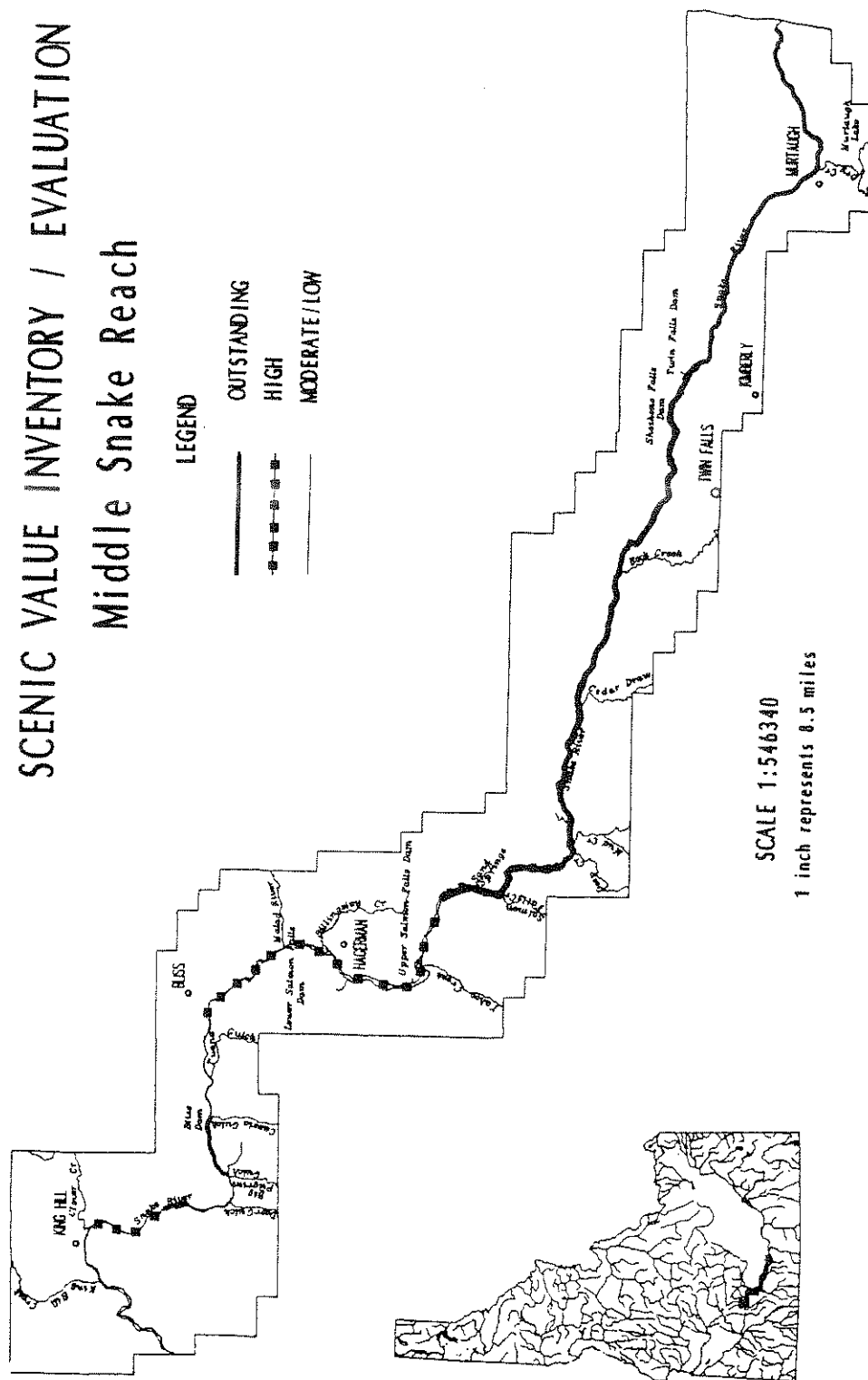


Figure 2. Scenic evaluation map.

## Geologic Features

The geologic features evaluation considered the uniqueness or significance of geologic features from a national or regional perspective, and the degree of protection accorded the resource through statute, regulation, or agency management policy. Geologic data came from the National Park Services National Natural Landmark studies, the Bureau of Land Management, and unpublished and published sources. An inventory of the Middle Snake reach identified landforms, water features (i.e., waterfalls, springs), cultural modifications to the site or along the segment, and distinctive features of the site or segment.

A numeric measure is used to evaluate the degree of geologic distinction of a feature under four factors: scarcity, quality, scientific value, and cultural modifications. The size and degree of disturbance related to historic land-use practices of the specific site were considered in the ranking.

Scarcity refers to the distribution of the feature both within the state and worldwide. Quality refers to the relative physical condition of the geological feature in comparison to other known occurrences of the same feature. A site which is among the best known examples of its kind received a higher evaluation mark than a marginal or low quality occurrence. The scientific value of a feature or a given site refers to its usefulness and importance as an educational resource. The historical, current use, potential use, and accessibility of the given feature or site was considered under the cultural modifications category.

Each factor was rated using a value of 0-5, with the exception of cultural modifications, which is rated from -2 to 2. The ranking system has a maximum of 15 points. Those segments with Outstanding or distinctive geologic features received scores of 11 to 15. Segments considered above average, but not outstanding, received scores of 6 to 10 and were rated High for geologic distinction. Segments with little distinction received a score of 5 or less and were rated Moderate to Low for geologic features.

## Geologic Features Evaluation for Middle Snake Reach

| CATEGORY        | CRITERIA  | MIDDLE SNAKE REACH  |
|-----------------|---|---|
| Outstanding     | Segments possessing distinctive or unique geologic features defined by scarcity, quality or scientific value (score of 11 to 15); limited in occurrences nationally or within the State; site is one of best known examples of geologic feature; size of features is distinctive; recognized as high quality study location; agency designation indicates national significance (National Monument, National Natural Landmarks) | <p><i>Twin Falls Reservoir to Blue Lakes Golf Course</i> - distinctive scabland topography remnant of Bonneville Flood has well-defined dry falls and displays flood scouring of canyon floor and sides; largest water falls in the state (height and width); site under consideration as a National Natural Landmark</p> <p><i>Crystal Springs to Thousand Springs</i> - discharge volume of Snake River Plain Aquifer from the canyon walls is unique on a global scale; 10 of 65 largest springs in the U.S. (discharge &gt; 100 cfs) are along this segment; Box Canyon is 11th largest spring in the U.S.; Niagara Springs is National Natural Landmark; Box Canyon is under consideration as a National Natural Landmark</p> <p><i>Upper Salmon Falls to Malad River</i> - Hagerman Fossil Beds is a National Monument; average discharge of Malad spring complex is &gt; 1,000 cfs; Malad Canyon displays distinctive features of the Bonneville Flood; Malad Canyon is under consideration as a National Natural Landmark</p> |
| High            | Segments with above average geologic features (score of 6-10); limited in occurrences regionally; distinctive, though somewhat similar to other comparable geologic features within the State; accessibility or land ownership may limit study of feature   | <p><i>Bliss Dam to Clover Creek</i> - sand dunes; melon gravel of large diameter deposited by Bonneville Flood in significant quantity</p> <p><i>Milner Dam to Dry Creek</i> - scabland topography along the top of the canyon remnant of Bonneville Flood; falls at Caldron Linn are the only undeveloped falls of the Middle Snake reach.</p>   |
| Moderate to Low | Segments with little distinction (score of 0-5); fairly common regionally; site does not clearly display feature; not recognized in literature or locally as a study location   | <p><i>Dry Creek to Twin Falls Reservoir</i></p> <p><i>Blue Lakes to Crystal Springs</i></p> <p><i>Thousand Springs to Upper Salmon Falls</i></p> <p><i>Malad River to Bliss Dam</i></p>   |

# GEOLOGIC FEATURES - EVALUATION Middle Snake Reach

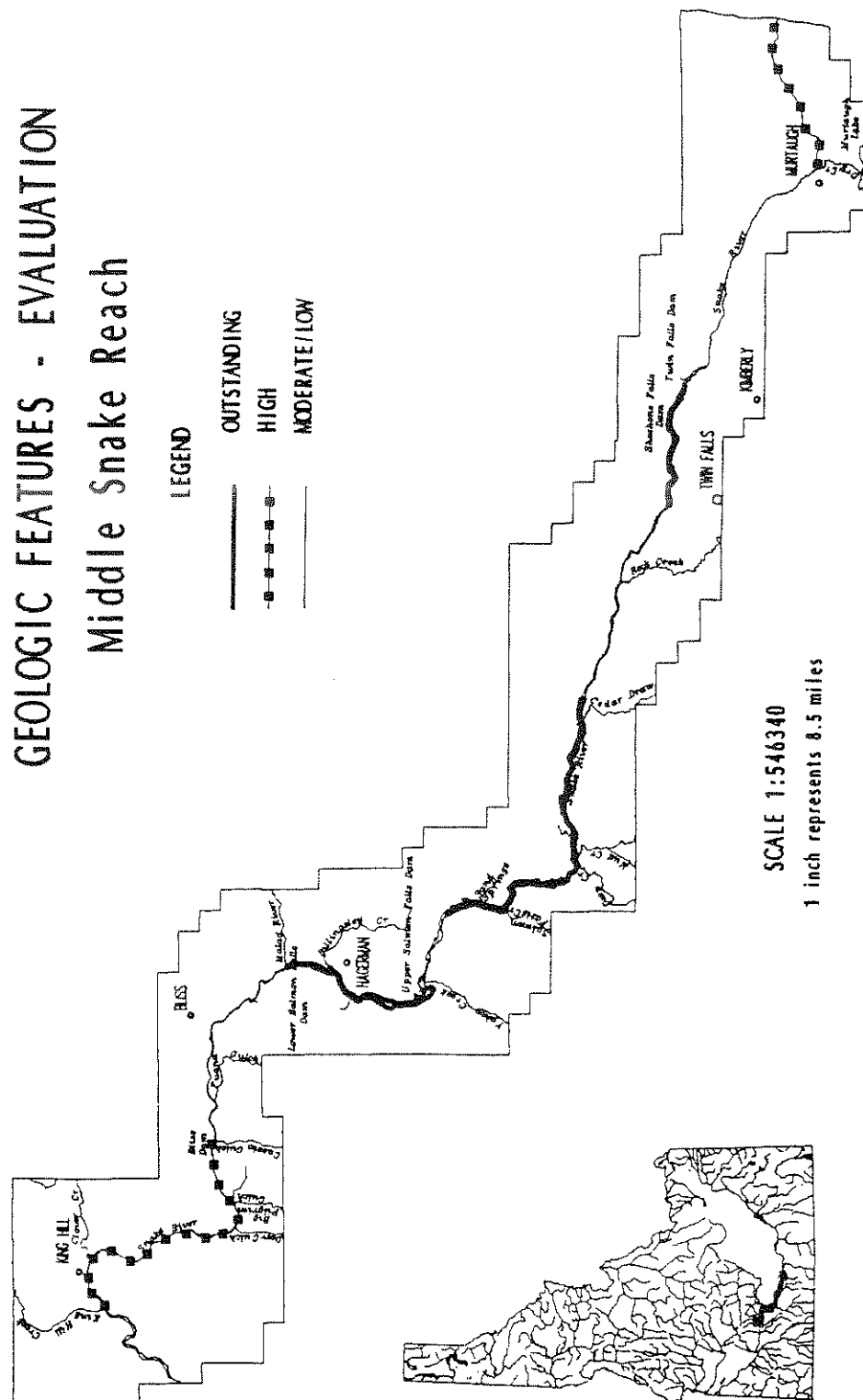


Figure 3. Geologic features evaluation map.

## Recreation

The recreation evaluation focused on recreational opportunities occurring within specific river reaches. The evaluation entailed identification of recreation units; analysis of the recreational diversity and importance of each unit; and categorization of a final evaluation value (Outstanding, High, or Moderate to Low) based on diversity and uniqueness of the recreational experiences available on the river segment.

The Middle Snake reach was grouped into thirteen segments or discrete recreation units delineated on the basis of landform, hydrology, land use patterns, visual character, and recreational use patterns. Each recreation unit was individually evaluated for recreational diversity and the importance of recreational opportunities. Specific recreational features of these units are summarized in evaluation assessment forms filed with the Department of Water Resources.

Recreational diversity is a measure of the variety of recreational activities available in the recreation unit. Four criteria were assessed to arrive at a diversity value: (1) identification of land-based and (2) water-based recreation opportunities, (3) natural features and (4) level of access. Land-based activities include camping, hiking, or hunting. Water-based recreation includes fishing, swimming, and boating.

Four criteria were assessed to determine recreational importance: (1) unique or rare features which enhance the recreation experience, (i.e., unusual landforms, hot springs, water falls or rapids), or highly-valued fisheries; (2) public concern for the recreational values of the unit (determined from public and advisory committee input, and agency consultation); (3) use based on recreational survey data; and (4) special designations and/or management objectives.

Land-based and water-based recreation activities occurring within the river corridor were identified through review of agency documents and maps describing recreation facilities; communications with various agencies and user groups; and review of several recreational surveys conducted by the IDPR, IDFG, Idaho Power Company and Myers Engineering Company, for various segments within the reach over the last fifteen years.

Natural features were identified which enhance recreation opportunities or experiences. Evaluation included a description of water characteristics influencing boating activity; a summary of the aesthetic values of the unit; identification of special wildlife habitat characteristics providing



increased opportunities for wildlife observation; and general viewing characteristics within the river corridor.

Level of access was described to provide information regarding the types of recreational activities possible, potential use volume, and opportunities for primitive or isolated recreation experiences versus a more developed recreation experience. Assessment of land- and water-based recreation activities, natural features and access levels resulted in a diversity rating for the recreation unit.

The final recreation evaluation class for each recreation unit was based on an assessment of the diversity and importance values described above. A recreation unit evaluated as Outstanding a) provides significant recreation opportunities encompassing a great diversity of activities; or b) provides a unique or rare experience within the region or planning area; or c) receives the highest use; or d) possesses an agency designation indicating national or regional significance.

A recreation unit evaluated as High is characterized by river segments a) receiving high use; or b) potentially providing an important recreation experience which is not rare but lacking in the region. Moderate to Low designations define those river segments with recreational opportunities typical in the region and receiving moderate to low use, and/or having low recreation diversity.

## Recreation Evaluation Criteria and Results for the Middle Snake Reach

| EVALUATION CLASS | CRITERIA   | RECREATION UNITS  |
|------------------|--|---|
| Outstanding      | Significant recreational opportunities available as indicated by a great diversity of activities; a unique or rare experience; highest use areas; or agency designation indicating the national or regional significance of recreational opportunities | <p><i>Milner Bridge to Main Milner Powerhouse</i> - unique expert whitewater boating run (Class V) at high flows</p> <p><i>Star Falls to Twin Falls Reservoir</i> - Star Falls one of the last undeveloped waterfalls in the reach, unique expert whitewater boating run comparable to the Grand Canyon (Class IV-IV+)</p> <p><i>Twin Falls Reservoir to Shoshone Falls Dam</i> - recreational use of reservoirs and parks is very high</p> <p><i>Crystal Springs to Thousand Springs (north end of Ritter Island)</i> - significant diversity combined with unique recreational opportunities</p> <p><i>Thousand Springs to Lower Salmon Falls Dam</i> - Hagerman National Monument and high diversity of recreational opportunities</p> <p><i>Lower Salmon Falls Dam to Bliss Bridge</i> - unique year round whitewater boating opportunity receiving significant use</p> <p><i>Bliss Dam to Clover Creek</i> - unique and highly-valued sturgeon fishing opportunities</p> |
| High             | River segments with a high use volume; and/or a recreation opportunity which is not rare but not typical in the region   | <p><i>Main Milner Powerhouse to Star Falls</i> - potential intermediate whitewater boating run offering easy access in an isolated setting</p> <p><i>Pillar Falls to Centennial Park</i> - high use volume</p>  |
| Moderate and Low | River segments with moderate to low use volume; low diversity of opportunities; and/or providing recreational opportunities typical and abundant within the region   | <p><i>Milner Dam to Milner Bridge</i> - low use and diversity</p> <p><i>Shoshone Falls Dam to Pillar Falls</i> - low use and recreation diversity</p> <p><i>Centennial Park to Rock Creek</i> - moderate recreation diversity</p> <p><i>Rock Creek to Crystal Springs</i> - low use and recreational diversity</p> <p><i>Bliss Bridge to Bliss Dam</i> - low use and recreational diversity</p>   |

# RECREATION EVALUATION Middle Snake Reach

## LEGEND

OUTSTANDING  
HIGH  
MODERATE/LOW

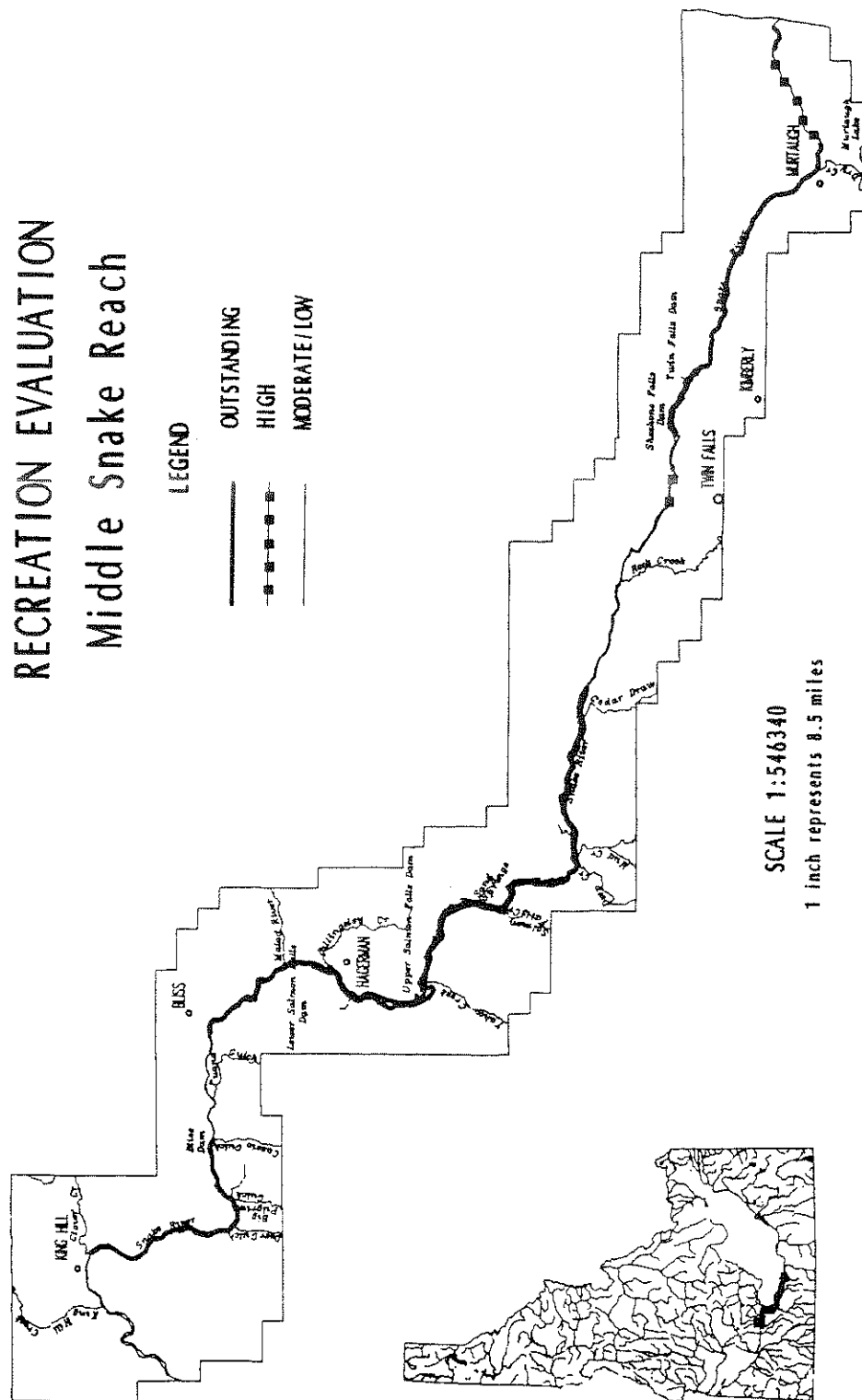


Figure 4. Recreation evaluation map.

## Fish & Wildlife

The fish and wildlife evaluation involved two steps: (1) delineation of biological ecosystems, and (2) evaluating the distinction of each unit. Segment boundaries define an area with similar characteristics, and for the most part are distinguished by whether they are a reservoir (lacustrine) or a free-flowing segment (riverine).

Physical and biological variables were identified to evaluate each segment as an ecosystem. The physical variables considered for each segment were:

1. Water Quantity
  2. Water Quality
  3. Springs or perennial tributaries with high spawning potential
  4. Fish habitat
    - (a) in a lacustrine environment--depth, shoreline, rocky substrate, and vegetation are evaluated
    - (b) in a riverine environment--pool:riffle ratio, and cover are evaluated
    - (c) water quantity
    - (d) water quality
- If all other physical parameters for fish habitat are good, but current water quantity/quality problems limit populations and species, habitat was rated Intermediate.
5. Wildlife habitat; heterogeneity would provide more niche opportunities and therefore greater or potentially greater species diversity (riparian woodland, springs, cliffs, etc.).

The biological variables taken into consideration were:

1. Sensitive species presence - aquatic (sturgeon, sculpin, snails)
2. Sensitive species presence - terrestrial (raptors, bats, plants, etc.)
3. Spawning
4. Special management areas (WMA, ACEC, wetlands)
5. High species diversity represented by several trophic levels.

In order for a segment to be considered Outstanding, four of the five physical criteria must be met, and four of the five biological criteria must be met. The justification for this assumes that in order for an ecosystem to warrant an Outstanding evaluation, it must be relatively whole and relatively healthy, and consequently, meet the majority of the criteria.

| Physical Habitat   |  |                                 |  |   |   |
|--|--|---------------------------------|--|---|---|
| Segment Name   | 1) Water quantity currently sufficient                           | 2) Water quality currently good | 3) Perennial tributaries or springs                                    | 4) Fish habitat: good*  | 5) Wildlife habitat: good**   |
| Milner   | No   | Yes                             | No   | No  | No  |
| Murtaugh   | No   | Yes                             | Yes  | Yes   | Yes   |
| Twin Falls Res.  | Yes  | Yes                             | Yes  | Yes   | No  |
| Devil's Corral   | Yes  | Yes                             | Yes  | Yes   | No  |
| Shoshone Falls Res.  | Yes  | Yes                             | No   | No  | No  |
| Auger Falls  | No   | No                              | Yes  | Yes   | No  |
| Kanaka Rapids  | No   | No                              | Yes  | No  | Yes   |
| Thousand Springs   | Yes  | No                              | Yes  | Yes   | Yes   |
| Dolman Rapids  | No   | Yes                             | No   | Yes   | No  |
| Lower Salmon Falls Res.  | Yes  | Yes                             | Yes  | No  | No  |
| Hagerman   | Yes  | Yes                             | Yes  | Yes   | Yes   |
| Bliss Res.   | Yes  | Yes                             | No   | No  | No  |
| King Hill  | Yes  | Yes                             | Yes  | Yes   | Yes   |
| *Lacustrine fish habitat: 1) Good--if it currently possesses following characteristics: good depth column, heterogeneous shoreline, rocky substrate, and vegetation cover. |  |                                 |  |   |   |
| *Riverine fish habitat: Good--if it currently possesses following characteristics: good pool:riffle ratio, cover, etc.   |  |                                 |  |   |   |
| **Wildlife Habitat: 1) Good terrestrial habitat is of high quality and provides numerous wildlife niches.  |  |                                 |  |   |   |
| Species  |  |                                 |  |   |   |
| Segment Name   | 1) Sensitive aquatic species present (sturgeon, sculpin, snails) | 2) Important spawning occurs    | 3) Sensitive terrestrial species present (raptors, bats, plants, etc.) | 4) Special management areas: WMA, ACEC, isolated wildlife tracts (IWT), Idaho Priority Wetlands (IPW) | 5) Unique species richness (high diversity, several trophic levels represented) |
| Milner   | Unknown  | No                              | Yes-plants   | IWT, IPW  | Yes   |
| Murtaugh   | Unknown  | No                              | Yes-plants   | IWT   | No  |
| Twin Falls Reservoir   | No   | Yes-salmonids                   | Yes-plants   | IWT, ACEC, IPW  | No  |
| Devil's Corral   | No   | Yes-salmonids                   | Yes-plants   | IPW   | No  |
| Shoshone Falls Res.  | No   | No                              | No   | None  | No  |
| Auger Falls  | Yes-sturgeon   | No                              | Yes-plants   | IPW   | Yes   |
| Kanaka Rapids  | Yes-sturgeon, sculpin, snails                                    | No                              | Yes-plants, blue grosbeak  | IWT, WMA  | Yes   |
| Thousand Springs   | Yes-sturgeon, sculpin, snails                                    | Yes-salmonids                   | Yes-plants   | WMA, IPW, ACEC  | Yes   |
| Dolman Rapids  | No   | No                              | No   | None  | Yes   |
| Lower S.F. Reservoir   | No   | No                              | No   | WMA   | No  |
| Hagerman   | Yes-sturgeon, sculpin, snails                                    | Yes-sturgeon, salmonids         | Yes-plants, bats, long-billed curlew                                   | IPW   | Yes   |
| Bliss Reservoir  | No   | No                              | Yes-plants   | None  | Yes   |
| King Hill  | Yes-sturgeon, snails   | Yes-sturgeon                    | Yes-plants   | None  | Yes   |

## Fish and Wildlife, Biological Communities Evaluation for the Middle Snake Reach

| EVALUATION CLASS | CRITERIA   | SEGMENTS   |
|------------------|--|--|
| Outstanding      | <p>Four out of five physical parameters must be met and four of the five biological parameters must be met:</p> <p><b>Physical Parameters</b></p> <ol style="list-style-type: none"> <li>1) Water quantity good OR reversible</li> <li>2) Water quality good OR reversible</li> <li>3) Perennial tributaries OR springs present</li> <li>4) Fish habitat good</li> <li>5) Wildlife habitat good</li> </ol> <p><b>Biological Parameters</b></p> <ol style="list-style-type: none"> <li>1) Sensitive aquatic species present (sturgeon, sculpin, snails)</li> <li>2) Important spawning occurs</li> <li>3) Sensitive terrestrial species present (raptors, bats, plants, etc.)</li> <li>4) Special management areas (WMA, ACEC, wetlands, etc.)</li> <li>5) Unique species richness; several trophic levels represented</li> </ol> | <p><i>Banbury Springs to Upper Salmon Falls Dam</i> - water quantity good; water quality reversible; perennial tributaries and springs; wildlife habitat has good heterogeneity; sturgeon and sculpin present; salmonid spawning; sensitive plants; isolated wildlife tracts; Idaho Priority Wetland; Wildlife Management Area, Area of Critical Environmental Concern (BLM)</p> <p><i>Lower Salmon Falls Dam to Bliss Bridge</i> - water quantity good; water quality good; perennial tributaries and springs; fish habitat = Good; wildlife habitat has good heterogeneity; sturgeon, sculpin present; spawning for sturgeon and salmonids; sensitive plants; Idaho Priority Wetland; several trophic levels are represented</p> <p><i>Bliss Dam to Clover Creek</i> - water quantity good; water quality good; perennial tributaries and springs; fish habitat = Good; wildlife habitat has good heterogeneity; sturgeon present; spawning for sturgeon; sensitive plants; several trophic levels are represented</p> |

# BIOLOGICAL EVALUATION Middle Snake Reach

LEGEND  
—— OUTSTANDING

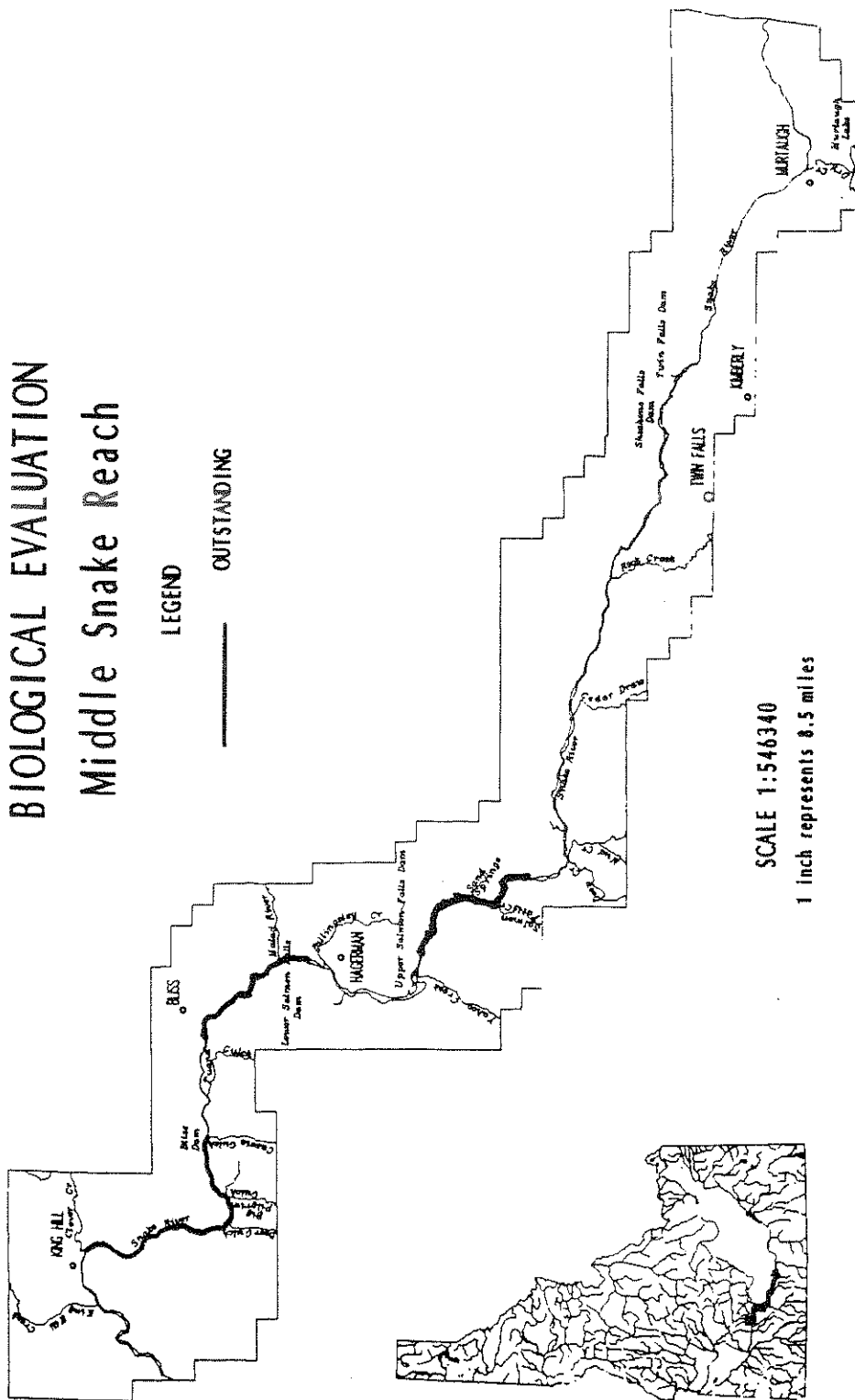


Figure 5. Fish and wildlife evaluation map.

All segments of the Middle Snake reach, with the exception of Bliss Reservoir, were found to possess at least one, and usually two or more, "Outstanding" classifications for either fish and wildlife, geologic features, scenic values, or recreation, as defined by criteria in Section III.

## **IV. WATER ISSUES AND CONSIDERATIONS**

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### **Water Allocation and Use**

The Snake River Basin is divided administratively at Milner Dam. Senate Bill 1358 amended the Idaho Code (1986) to provide that no water above Milner Dam shall be considered in the determination and administration of rights downstream from Milner Dam.

#### **SWAN FALLS AGREEMENT**

The Swan Falls agreement, between the State of Idaho and the Idaho Power Company, establishes certain rights and policies concerning water use in the Snake River basin above the Swan Falls Dam near Murphy, Idaho (approximately 100 miles downriver from King Hill). The State agreed to assert that the Snake River is fully appropriated above Swan Falls Dam. Consequently, the Idaho Legislature determined that an adjudication of the entire Snake River basin was in the public interest, and should proceed subject to stated constraints regarding federal reserved right claims (Idaho Code 42-1406A).

The solicitation of water right claims began in February, 1988. The Idaho Department of Water Resources is presently ascertaining both surface and groundwater rights for the Snake River Basin. This process is expected to determine approximately 135,000 claims to water rights.

#### **MORATORIUM ON SNAKE RIVER BASIN WATER RIGHTS**

On May 15, 1992, the Director of the Department of Water Resources ordered a moratorium on the issuance of permits to divert and use water from the Snake River Basin upstream from the USGS gaging station near Weiser, Idaho for new consumptive uses. The order was established to protect existing water rights and established minimum stream flows. The moratorium applies to all applications proposing a consumptive use of water filed after the date of the order, except as defined below, and to all applications filed prior to the entry of the order for which approval had not been given. The moratorium is tied to the drought conditions existing when the order was issued, and it will last until the Director rules that the drought has ended.



The moratorium does not apply to (1) any application for domestic purposes as defined in Idaho Code 42-111; (2) any application proposing a nonconsumptive use of water; (3) applications seeking to appropriate ground water as a supplemental water supply conditioned to allow use only when the appurtenant surface sources are not available due to drought conditions; and (4) applications for drilling permits to replace or deepen existing wells having valid existing water rights.

## CURRENT WATER USE

The natural flow of the Snake River above Swan Falls is fully appropriated during years of below normal run-off. Annual irrigation diversions from the Snake River in Milner Reservoir average 2,697,000 acre-feet under present conditions. Consumptive use is an estimated 30 percent of irrigation diversions, ground-water recharge is 60 percent, and return flow averages 10 percent. Table 1 estimates present water use, and Table 2 outlines water budgets for the Middle Snake reach calculated by the USGS in 1980.

Table 1. Estimated Annual Water Use in Gooding, Jerome, and Twin Falls Counties

|                                    | Gooding    |    | Jerome    |    | Twin Falls |    |
|------------------------------------|------------|----|-----------|----|------------|----|
| Aquaculture                        | 1,370,000  | AF | 152,000   | AF | 131,000    | AF |
| Hydropower Generation              | 14,596,000 |    | 538,000   |    | 7,673,000  |    |
| Industrial                         | 1,790      |    | 100       |    | 10,900     |    |
| Irrigation†                        |            |    |           |    |            |    |
| Ground Water Withdrawals           | 124,000    |    | 133,500   |    | 80,000     |    |
| Surface Water Withdrawals          | 450,000    |    | 1,200,000 |    | 1,150,000  |    |
| Nonindustrial Public-Supply Water  | 1400       |    | 2200      |    | 3800       |    |
| Rural Domestic and Livestock Water | 1200       |    | 1400      |    | 1300       |    |

†Irrigation withdrawals for Snake River Plain and canyon bottom lands within the planning area; does not include water use in the Salmon Falls or Wood River watersheds, or on lands in southern Twin Falls County or northern Gooding County outside the U.S.G.S. delineation of the Snake River Plain. Irrigation withdrawals from the Middle Snake reach for the King Hill Irrigation District in Elmore County total approximately 32,000 acre-feet.

Source: Goodell, 1988

Table 2. Water Budgets for Middle Snake Reach, 1980

| Reach                 | Inflow (Thousands of acre-feet) |                           |       | Outflow (Thousands of acre-feet) |            |       | Residual               |
|-----------------------|---------------------------------|---------------------------|-------|----------------------------------|------------|-------|------------------------|
|                       | Snake River                     | Tributaries and drainages | Total | Snake River                      | Diversions | Total | Gain from ground water |
| Milner to Kimberly    | 1,290                           | 10                        | 1,300 | 1,510                            | --         | 1,510 | 210                    |
| Kimberly to Buhl      | 1,510                           | 320                       | 1,830 | 2,710                            | --         | 2,710 | 880                    |
| Buhl to Hagerman      | 2,710                           | 270                       | 2,980 | 5,590                            | 40         | 5,630 | 2,650                  |
| Hagerman to King Hill | 5,590                           | 220                       | 5,810 | 6,780                            | 50         | 6,830 | 1,020                  |

Source: Kjelson, 1992.

An inventory and description of resources, resource development, and the current use or status of resource use in the Middle Snake region is provided in Appendix B: Area Overview and Resource Summary.

## **MINIMUM STREAM FLOWS**

The State may appropriate previously unappropriated water for instream use. Minimum stream flow water rights are enforced by not allowing appropriations of a later priority date if the diversion would result in a flow decrease below the minimum flow (Idaho Code 42-1505).

A minimum flow of zero is specified for the Snake River at Milner Dam in the State Water Plan. This is recognition that flow has sometimes been reduced to zero at the dam. In licensing the Milner hydropower project, the Federal Energy Regulatory Commission (FERC) has specified "target flows" for the Snake River at Milner Dam (200 cfs). The target flow must be satisfied only when water in excess of irrigation needs is available (FERC, 1990). Target flow water may be acquired from Idaho Power Company storage in American Falls Reservoir, or may be leased from the Upper Snake Rental Pool. FERC estimates that water will be available in sufficient quantities to meet the Milner target flow in most years. Other minimum flows on the Snake River are 3900 cfs (April 1 to October 31) and 5600 cfs (November 1 to March 31) at Murphy, Idaho, and 4750 cfs at Weiser.

The Idaho Water Resource Board has applied for minimum stream flow water rights on thirteen springs or spring creeks and on the Malad River, all of which are tributary to the Middle Snake reach (Table 3). Nine of the spring filings have been permitted while the others are still in the application stage.

## **SPRINGS**

Springs tributary to the Middle Snake reach have been utilized since pre-historic times. Today, the springs are used as a source of water for irrigation of bottom lands along the river; as a consistent supply of high-elevation water to drive hydroelectric plants; as a relatively stable source of well aerated, constant temperature water needed to maintain fish hatcheries and trout farms. In recent years, the picturesque springs have drawn an increasing number of tourists who enjoy the many recreational aspects of the area.

Because of the importance of the springs to the local economy, declines in the quality or quantity of flow are a cause for concern. Previous investigations have established a correlation between changes in the ground-water regime of the Snake River Plain Aquifer and a change in spring discharge. Users of spring flow are concerned that recent changes in irrigation practices upstream

from the springs and increased withdrawals of ground water from the Snake River Plain Aquifer are affecting spring discharge.

**Table 3. Middle Snake Reach Spring Development**

|  |   | Minimum Stream Flow Water Right       |
|--|---|---------------------------------------|
| <i>Vineyard Creek</i>                        | Undeveloped   | 17 cfs                                |
| <i>Devil's Corral Springs</i>                | Undeveloped: 48 cfs pending for fish farming and hydropower   | 48 cfs                                |
| <i>Blue Lakes Springs</i><br>(Alpheus Creek) | The springs and upper reaches of the outflow streams are undeveloped and flow through the Blue Lakes Country Club. In its lower reaches water is heavily diverted for fish farming and municipal use. Pending applications propose further development for fish farming, hydropower, and aesthetic uses.                          |                                       |
| <i>Crystal Springs</i>                       | Developed for fish farming and irrigation. This complex of springs supplies water to a large federal steelhead hatchery and a private fish farm. There are existing permits and pending applications for development for fish farming and hydropower.   | 126 cfs                               |
| <i>Niagara Springs</i>                       | Developed for fish farming and irrigation.<br>Other pending applications propose development for fish farming and hydropower.   | 45-264 cfs - pending                  |
| <i>Clear Lakes Springs</i>                   | Developed for fish farming, fish processing, irrigation, and hydropower. Pending applications and undeveloped permits propose further development for fish farming, hydropower, irrigation, and aesthetics.   |                                       |
| <i>Briggs Springs</i>                        | Developed for irrigation, fish farming, and hydropower.<br>Pending applications propose further development for fish farming.   | 56 cfs - pending                      |
| <i>Banbury Springs</i>                       | A large spring complex which is only partly diverted.<br>Existing diversions are for irrigation, domestic use, recreation (a commercial swimming pool resort), and a small private hydro plant. Other pending applications propose development of existing diversions and flows not now diverted for fish farming and hydropower. | 97 cfs - pending                      |
| <i>Blind Canyon</i>                          | Developed for fish farming.   | 8 cfs                                 |
| <i>Box Canyon Springs</i>                    | Developed for fish farming and hydropower.<br>There is an existing permit for further fish farming development.   | 75-162 cfs<br>850 & 550 cfs - pending |
| <i>Blue Heart Springs</i>                    | Undeveloped<br>This large spring emerges in the bed of the Snake River below the water level, and is a popular scuba diving area.   | 66.57 cfs                             |
| <i>Sand Springs</i>                          | Developed for hydropower.   | 34 cfs                                |
| <i>Minnie Miller Springs</i>                 | Developed for irrigation, stock, domestic, and commercial uses.   | 200-450 cfs                           |
| <i>Magic or Bickel Springs</i>               | Developed for fish farming, irrigation, and a small private hydro plant. Pending applications propose expansion of the existing fish farm and commercial hydro development.   |                                       |
| <i>Billingsley &amp;</i>                     | Extensively developed for irrigation, fish, stock,  |                                       |

|  |  |                  |
|--|--|------------------|
| <i>Riley Creek systems</i>                       | domestic, hydropower, & municipal uses.  |                  |
| <i>White Springs</i>                             | Developed for fish farming.  | 11 cfs - pending |
| <i>Birch Creek</i>                               | Developed for irrigation under decreed rights, & irrigation, fish, & power under permits and licensed rights.          |                  |
| <i>Lower Malad River</i>                         | Developed primarily for hydropower.<br>Undiverted water is subject to a number of MSF rights covering various reaches. |                  |
| <i>Springs in the Malad River to Bliss reach</i> | Numerous springs in this reach are developed for irrigation, fish farming, hydropower, and other uses.                 |                  |
| <i>Bancroft Springs</i>                          | Undeveloped.   | 17 cfs           |

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## River Regulation

River regulation is a function of the operations of the Bureau of Reclamation, Water District 01, and the Idaho Power Company. Operations above Milner Dam control flows to meet storage, power, and irrigation diversion rights upstream. The storage and diversion system of the Upper Snake basin fully regulates the river in the driest one-fifth of all years. During very dry years little flow passes Milner in the early irrigation season. However, in recent years Idaho Power Company has used its American Falls storage (approximately 45,000 acre-feet), plus water obtained from the rental pool to raise flows to the range of 600 to 1000 cfs in late June or early July. Flows of this magnitude have then been maintained as long as available storage permitted or until diversions end in the fall. When the Milner power plants begin operation in late 1992, Milner Reservoir will be kept full and a target flow of 200 cfs will be released, if available.

### BUREAU OF RECLAMATION

Flows of the Snake River above Milner are determined primarily by Bureau of Reclamation reservoir operations. The Bureau manages in a system operation approximately 4 million acre-feet of water storage capacity in the Upper Snake Basin in Idaho and Wyoming. Existing federal reservoirs include American Falls, Grassy Lake, Island Park, Jackson Lake, Lake Walcott, Palisades, and Ririe (Table 4).

The reservoirs store streamflow during the winter and spring months, then release storage to augment natural flows during the summer irrigation season. There are variations from the pattern at some reservoirs when flood control operations delay reservoir filling. Streamflow forecasts are used to maximize summer yields for irrigation and operate reservoirs during the peak runoff period in such a manner that the storage space used to control flood discharges will be full when flood threats have passed.

Power facilities have been installed at three of the mainstem Reclamation reservoirs. As seasonal operation of these reservoirs is normally dependent on irrigation and flood control functions, the monthly flow fluctuations are not significantly affected by power operations.

**Table 4. Bureau of Reclamation Reservoirs Above Milner.**

|                | Total Storage (AF) | Purpose   |
|----------------|--------------------|---|
| American Falls | 1,672,000          | Irrigation/Power  |
| Grassy Lake    | 15,450             | Irrigation  |
| Island Park    | 135,200            | Irrigation  |
| Jackson Lake   | 847,000            | Flood Control/Irrigation  |
| Lake Walcott   | 210,000            | Irrigation/Power  |
| Palisades      | 1,402,000          | Fish and Wildlife/Flood Control/Irrigation/Municipal/Power/Recreation |
| Ririe          | 100,000            | Fish and Wildlife/Flood Control/Irrigation/Recreation                 |

## **WATER DISTRICT 01**

Delivery of water is the responsibility of district watermasters under the supervision of the Idaho Department of Water Resources. The watermaster for Water District 01 administers water rights above Milner Dam. The existing network of irrigation organizations in the Upper Snake Basin is extensive. Over 300 associations divert flows from the Snake River above Milner Dam.

### ***Rental Pool***

The Idaho Legislature provided the Idaho Water Resource Board (IWRB) with the authority to operate water banks in 1979. Water Bank rules and regulations were adopted by the IWRB in 1980, and revised in 1991 and 1992. A water rental pool has been in existence in the Upper Snake River Basin since 1919. Prior to 1979 it operated on an informal basis. The Board appointed the Committee of Nine as the local entity to operate the water bank for District 01. The Committee of Nine is an advisory committee representing major irrigation entities in District 01.

The Upper Snake Rental Pool is the largest and most active water bank in Idaho. Since 1979, an average of 350,000 acre-feet of space has been leased (consigned) to the rental pool, and an average of 178,000 acre-feet has gone unused (Table 5). Of the total 1,584,328 acre-feet consigned

to the rental pool since the drought began in 1987, 46 percent has not been rented. However, in 1992, the sixth year of a continuous drought, only 9,953 acre-feet was leased to the Upper Snake Rental Pool, while requests for irrigation water far outstripped supply.

**Table 5. Water District 01 Water Bank Activity**

|      | Total Consignments | Total Amt.<br>Used | Total Used by IPC | Total Used by<br>Irrigators | Total<br>Unused |
|------|--------------------|--------------------|-------------------|-----------------------------|-----------------|
| 1979 | 88,870             | 73,960             | 50,000            | 23,960                      | 14,910          |
| 1980 | 72,190             | 14,575             | 0                 | 14,575                      | 57,615          |
| 1981 | 170,107            | 149,039            | 125,000           | 24,039                      | 21,068          |
| 1982 | 290,426            | 203,515            | 200,000           | 3,515                       | 86,911          |
| 1983 | 540,606            | 353,084            | 350,000           | 3,084                       | 187,522         |
| 1984 | 806,400            | 277,433            | 275,000           | 2,433                       | 528,967         |
| 1985 | 497,302            | 362,169            | 350,000           | 12,169                      | 135,133         |
| 1986 | 895,642            | 159,735            | 150,000           | 9,735                       | 735,907         |
| 1987 | 365,006            | 192,506            | 150,000           | 42,506                      | 172,500         |
| 1988 | 236,050            | 186,181            | 50,000            | 136,181                     | 49,869          |
| 1989 | 450,319            | 115,736            | 150,000           | 15,736                      | 334,583         |
| 1990 | 295,000            | 168,800            | 63,000            | 105,800                     | 126,200         |
| 1991 | 228,000            | 181,000            | 99,000            | 82,000                      | 47,000          |
| 1992 | 9,953              | 9,921              | 0                 | 9,921                       | 32              |
| Avg. | 353,276            | 174,832            | 143,714           | 34,690                      | 178,444         |

The primary purpose of the Upper Snake Rental Pool is to meet the requirements of irrigation water users within Water District 01, and priority in renting water is given to irrigators above Milner. However, the largest purchaser of District 01 rental pool water has been Idaho Power.

#### ***Shoshone-Bannock Tribal Water Bank***

The Fort Hall Indian Water Rights Agreement of 1991 provides for a Shoshone-Bannock Tribal Water Bank. The Bank will be operated by a Tribal Rental Pool Committee and will contain up to 83,900 acre-feet of space in Palisades Reservoir and up to 46,931 acre-feet in American Falls Reservoir. Water that accrues to Tribal storage space in Palisades may not be released for use past Milner. The Tribal water stored in American Falls Reservoir may be used for minimum streamflows below Milner Dam without refill penalties being incurred by the Tribe. Water users within the Fort Hall Indian Irrigation Project have a right of first refusal to rent any storage water available from the rental pool.

#### **IDAHO POWER**

Water rights issued by the State, license articles issued by the Federal Energy Regulatory Commission (FERC), and customer loads govern flow releases at Idaho Power projects in the Middle Snake reach. The Middle Snake hydroelectric facilities are primarily run-of-river projects, depending

mainly on natural streamflows for power generation. However, during low flow periods, storage permits a limited amount of block loading, resulting in some hourly flow fluctuations. Operating rules on the Middle Snake facilities vary by project. Facilities at Lower Salmon Falls and Bliss have storage which permits additional daily and weekly flexibility in power operations. The limited storage precludes any significant effect on seasonal flow variations within the reach, but water rentals from the District 01 rental pool may have a significant impact on flow patterns.

Power use or customer demand varies through a 24-hour cycle. Daily peaks occur in the morning and early evening. Lower Salmon Falls Dam is operated on a 24 hour cycle whereby the reservoir is drafted an average of 1.5 feet between the hours of 7:00 am and 10:00 pm, and refilled during the remaining hours with no net storage or depletion from one 24-hour period to the next. Plant flow is adjusted to maintain the reservoir cycle. Bliss Dam and Lower Salmon Falls Dam follow system load swings, however, most of Idaho Power's peaking operations are confined to the Hells Canyon complex (Fig. 6). Flow fluctuations at either Lower Salmon Falls or Bliss average 3,000 cfs over a 24-hour period (Fuhrman, 1992).

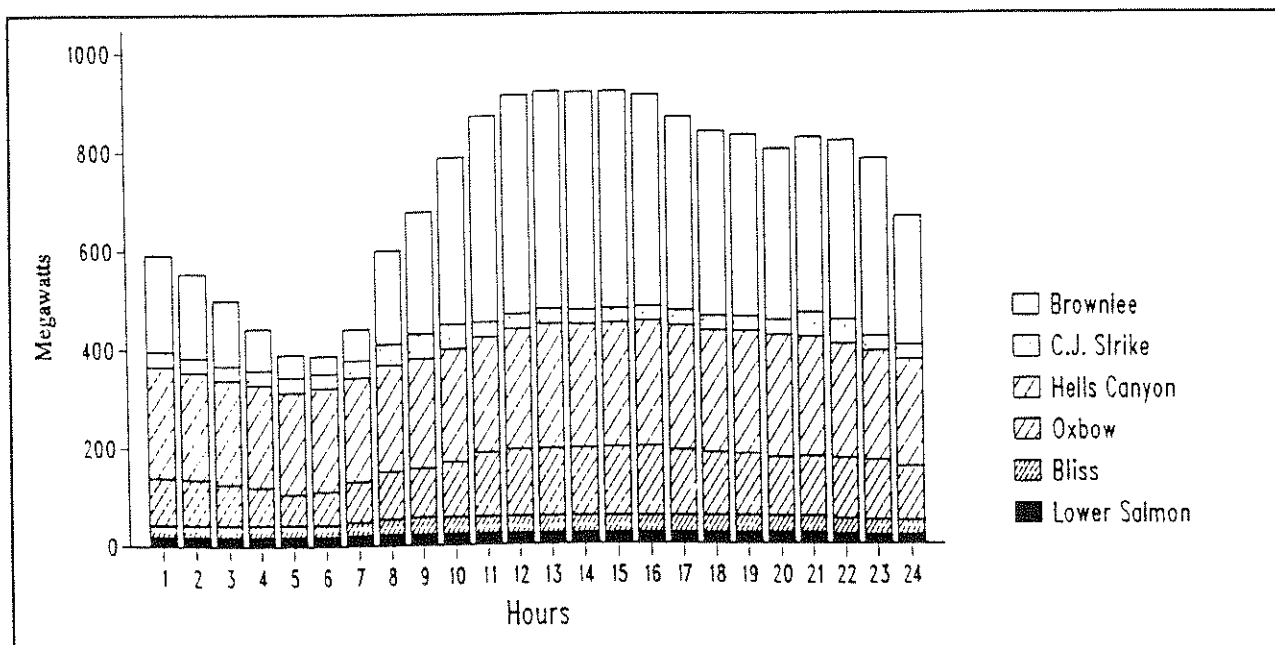


Figure 6. Average summer-day hydropower resource response to loads - Idaho Power Company (Fuhrman, 1992).

## SALMON FLOWS

The timing of water flow through the Middle Snake reach could be modified significantly as a result of actions taken pursuant to the federal Endangered Species Act. The National Marine Fisheries Service listed Idaho's sockeye salmon as "endangered" under the federal Endangered Species Act in 1990. Three runs of wild chinook salmon were added to the list as "threatened" in 1992. In 1990 adult chinook salmon numbers were 75 percent below runs of the 1960s and only four adult sockeye returned to the state in 1991.

The National Marine Fisheries Service is required to develop a salmon recovery plan. The Northwest Power Planning Council at the request of the northwest governors, the congressional delegation, and the National Marine Fisheries Service, developed a comprehensive salmon plan. Council recommendations include:

1. Increased flows in the Snake River during the spring out-migration by drawdowns of lower Snake River reservoirs to near minimum operating level and providing additional water out of Dworshak Dam.
2. Operation of Brownlee reservoir by Idaho Power Company so upper Snake River Basin water is passed to assist spring migrants.
3. Study of the potential for new storage in the Snake River Basin to provide additional water.
4. Water efficiency improvements, water conservation, improved forecasting, water marketing, dry year option leasing, storage buy-backs and other measures to secure substantial additional Snake River water for spring migrants.
5. A call for states to conduct water availability studies, establish minimum instream flow levels, deny new water appropriations that would harm anadromous fish, and acquire existing water rights on a voluntary basis to improve fish flows.
6. Improved enforcement of water rights at diversions, including measuring devices.

Idaho Code (42-1763A) was amended to provide interim authority for storage water from reservoirs within Idaho to be rented through the Water Bank to augment flows for salmon migration, provided such flows are used for power production purposes within the state. Idaho Power has acted as the purchasing agent of salmon flow augmentation water for the Bonneville Power Administration (BPA). The Company purchased 99,000 acre-feet of water from the Upper Snake Rental Pool in 1991/92 for salmon flow augmentation; 50,000 acre-feet was released past Milner Dam from July 13 through August 17, 1991, which caused flows in the Middle Snake reach to increase from 200 cfs to 600 cfs for 19 days in July, and to about 800 cfs for 17 days in August. Another 49,000 acre-feet was released in the winter of 1992.



The Bureau of Reclamation, in cooperation with federal and state agencies and the Northwest Power Planning Council, is conducting an appraisal study of potential storage sites in the Snake River basin above Lower Granite Dam and Reservoir. The study will provide information on storage water supply potential and costs to meet both water augmentation flows and refill of the four lower Snake River reservoirs. Initial inventories listed sites at Deer Gulch and Pilgrim Gulch, tributaries to the Middle Snake reach.

## **Flood Control**

The Middle Snake reach shows no appreciable flood problems. The Snake River, in this reach, flows through a deep narrow canyon cut in the Snake River Plain. Developed lands adjoining the river are generally above the elevation of flood discharge. In addition, upstream regulation and diversion for irrigation substantially reduces flow peaks. Local flooding may, however, occur along tributaries (U.S. CoE, 1961). Annual maximum flows of the Snake River occur generally in the months of April through June, but have occurred in all months of the year, except August and September (Table 8). Late spring or summer snowmelt rarely exhibits a sudden flood peak, but fall or winter rainstorms may produce characteristically abrupt crests.

The regulation of the Snake River between Heise and Milner reduces natural flood flows. Peaks in most years will not exceed 20,000 to 30,000 cfs and will cause little flood damage (U.S. CoE, 1961). As a result of regulation, frequency curves for high flows on the Snake River have flattened as upstream storage has increased. However, because the degree of regulation may vary from year to year, high- and low-flow frequency curves for regulated streams are unreliable for estimating future events. The combined capacity of reservoirs along the Snake River above Milner Dam is approximately 4,300,000 acre feet and is considered sufficient for lowering peak flows. However, only Palisades and Ririe were constructed with stated flood control benefits. Idaho Power's reservoirs, or pools, within the reach are for power generation and have no flood storage allocation.

The numerous irrigation diversions between American Falls Reservoir and Milner Dam also serve to alleviate flood flows. Since there are no appreciable inflows there is an actual decrease in flow below American Falls from May through the end of September. For the purposes of county flood insurance studies, canal diversions are considered effective for flood control.

The largest flood on record for the Columbia River Basin occurred in 1894. In the Middle Snake reach the 1894 flood had a maximum discharge approximating 80,000 cubic feet per second.

Table 6. Instantaneous Peak Discharge at King Hill, Idaho

| Water Yr. | Cfs    | Date  | Water Yr. | Cfs    | Date  | Water Yr. | Cfs    | Date  |
|-----------|--------|-------|-----------|--------|-------|-----------|--------|-------|
| 1909      | 41,900 | 06/11 | 1936      | 27,800 | 06/08 | 1963      | 27,200 | 06/22 |
| 1910      | 34,000 | 05/02 | 1937      | 12,700 | 05/11 | 1964      | 32,000 | 06/23 |
| 1911      | 38,100 | 06/22 | 1938      | 27,800 | 05/06 | 1965      | 31,900 | 12/23 |
| 1912      | 37,400 | 06/17 | 1939      | 17,800 | 04/11 | 1966      | 18,500 | 01/17 |
| 1913      | 36,500 | 06/12 | 1940      | 11,300 | 05/01 | 1967      | 22,900 | 07/19 |
| 1914      | 37,500 | 06/10 | 1941      | 9,560  | 11/12 | 1968      | 18,600 | 06/18 |
| 1915      | 26,300 | 11/16 | 1942      | 21,200 | 04/26 | 1969      | 24,000 | 04/27 |
| 1916      | 24,800 | 05/12 | 1943      | 31,000 | 06/07 | 1970      | 24,800 | 05/11 |
| 1917      | 36,600 | 05/31 | 1944      | 27,100 | 06/15 | 1971      | 33,400 | 04/27 |
| 1918      | 47,200 | 06/22 | 1945      | 24,900 | 06/12 | 1972      | 29,100 | 04/17 |
| 1919      | 18,100 | 03/30 | 1946      | 28,000 | 04/29 | 1973      | 20,800 | 11/08 |
| 1920      | 20,900 | 05/19 | 1947      | 29,600 | 06/14 | 1974      | 30,600 | 04/23 |
| 1921      | 37,900 | 06/03 | 1948      | 23,400 | 06/25 | 1975      | 28,100 | 05/01 |
| 1922      | 28,700 | 05/24 | 1949      | 18,100 | 02/25 | 1976      | 28,400 | 04/15 |
| 1923      | 23,300 | 06/27 | 1950      | 29,500 | 06/28 | 1977      | 18,400 | 12/03 |
| 1924      | 15,800 | 02/08 | 1951      | 25,600 | 04/16 | 1978      | 17,500 | 04/11 |
| 1925      | 25,400 | 05/26 | 1952      | 27,800 | 05/10 | 1979      | 24,100 | 01/12 |
| 1926      | 15,300 | 11/10 | 1953      | 27,900 | 06/11 | 1980      | 28,900 | 06/06 |
| 1927      | 34,100 | 07/04 | 1954      | 19,100 | 05/30 | 1981      | 20,700 | 06/12 |
| 1928      | 26,200 | 06/01 | 1955      | 18,400 | 04/02 | 1982      | 26,000 | 04/17 |
| 1929      | 21,000 | 04/08 | 1956      | 29,400 | 06/04 | 1983      | 32,400 | 05/12 |
| 1930      | 16,300 | 11/04 | 1957      | 30,300 | 05/22 | 1984      | 33,700 | 06/15 |
| 1931      | 14,000 | 11/22 | 1958      | 19,000 | 04/25 | 1985      | 24,000 | 10/21 |
| 1932      | 14,900 | 02/28 | 1959      | 16,400 | 10/16 | 1986      | 30,900 | 04/07 |
| 1933      | 11,800 | 12/19 | 1960      | 15,300 | 03/07 | 1987      | 21,000 | 10/30 |
| 1934      | 9,800  | 10/24 | 1961      | 14,700 | 12/17 | 1988      | 11,600 | 10/21 |
| 1935      | 7,980  | 01/06 | 1962      | 21,600 | 05/02 | 1989      | 14,100 | 02/27 |

Source: U.S. Geological Survey.

Although some damage must have occurred in the newly settled town of Hagerman, there is no mention of the event in historic documents. Maximum flows since 1909 are 40,000 cubic feet per second at Milner Dam and 47,200 cfs at King Hill in June, 1918. According to Idaho Department of Water Resources and Corps of Engineers records there are no levees for flood control between Milner and King Hill.

Local flooding caused by spring thaws, ice jams or heavy summer thunder storms has occurred along tributaries to the Middle Snake reach. Flooding caused by severe thunder storms tends to be localized and of short duration. The highest flows usually occur during the winter when

there is a lack of percolation into frozen ground or when heavy rainfall augments runoff from existing snowpack (Gooding County, 1985a).

## **Future Development**

The Future Development section examines only prospective ventures and programs related to each resource category. An inventory and description of resources and resource development, and the current use or status of resource use in the Middle Snake region is provided in Appendix B: Area Overview and Resource Summary.

### **FISH AND WILDLIFE**

Fish and wildlife development options primarily focus on actions that will allow for conservation and recovery of species that are considered sensitive: the white sturgeon, Shoshone sculpin and five species of mollusks. Management practices may change in the near future to protect and preserve these species, particularly those listed under the federal Endangered Species Act. A conservation plan will be developed for recovery of the five mollusc species that are federally listed as endangered and threatened.

The Shoshone sculpin will probably be upgraded in the near future to a candidate C1 category (Duke, 1992). A C1 category means that the U.S. Fish and Wildlife Service currently has substantial information to support the appropriateness of listing as endangered or threatened. If listing occurs, a conservation plan will be developed to provide for their recovery.

While the white sturgeon is not yet federally listed, the Idaho Department of Fish and Game (IDFG) considers the Snake River population a Category A: Priority Species, which means that they are either in low numbers, limited in distribution, or have suffered significant habitat losses (Moseley and Groves, 1992). Consequently, they intend to continue the catch-and-release policy and reintroducing individuals to those free-flowing stretches below Shoshone Falls (except possibly below Bliss, where the population is considered to be doing well). Hydropower facility activities that affect the white sturgeon will most likely be addressed in FERC licensing and relicensing proceedings.

The management direction of the IDFG for the salmonid and warmwater game species varies within the Middle Snake reach, and is largely dependent on whether they are managing a free-flowing stretch or a reservoir. Plan details can be found in their Fisheries Management Plan (1991-95). The IDFG has maintained that proposed hydropower facilities on both the Middle Snake or its tributaries

that would have potential negative consequences on the fisheries are opposed by the Department (IDFG, 1991).

In general, the IDFG will continue to stock hatchery rainbow and cutthroat trout where the native populations are depleted or nonexistent. For the most part, the clean tributaries and their habitats will be managed for wild trout spawning. IDFG is planning to renovate spring channels between Shoshone Falls and Upper Salmon Falls over the next few years to improve spawning habitat. Sediment will be removed and gravel added (Partridge, 1992). Warmwater species, such as smallmouth bass and channel catfish, are considered for stocking in certain mainstem reaches and the Malad River.

IDFG has placed several hundred wood duck and Canada goose nest boxes throughout the Middle Snake reach. Plans are to rebuild those that have deteriorated and add new ones (Smith, 1992). Through the Habitat Improvement Program (HIP), the IDFG hopes to encourage more private land owners to place nest boxes on their property. IDFG reports that Canada geese are moving out of the area due to hunting pressure (Smith, 1992). IDFG intends to place additional hunting closures on geese to provide them sanctuaries and encourage them to remain in the area.

## **SCENIC RESOURCES AND GEOLOGIC FEATURES**

Future actions taken with respect to scenic and geologic values entail interpretation, scientific research, or agency designations for the purpose of protecting outstanding or significant features within the planning area.

Designations encompassing scenic values are (1) federal wild and scenic rivers and (2) areas of critical environmental concern (ACECs). The Shoshone District BLM has conducted initial eligibility studies under the Wild and Scenic Rivers Act. Several segments in the planning area were determined to possess "outstandingly remarkable" scenic values (U.S. BLM, Shoshone District, 1992). Future actions will entail a suitability study evaluating the feasibility of federal wild and scenic designation.

There are three potential National Natural Landmarks (NNL) proposed for the Middle Snake reach -- Dry Cataracts, Box Canyon, and Malad Canyon. Designations recognize and encourage preservation of nationally significant geological or ecological features of an area. This designation may elicit scientific and educational programs, or management actions to preserve an area's significant features. There is a moratorium on NNL designations, so additional designations in the planning area are not expected in the near future.

The Hagerman Fossil Beds will see some development in the future as a result of its recent designation as a national monument. Interpretation of geologic features may include an overlook and wayside exhibits, visitor stations, trails for guided and self-guided tours, and a research/visitor center for interpretation and display of fossils.

A common geologic hazard associated with the Hagerman Fossil Beds is landslides. Previous studies indicate that irrigation wasteways are a primary contributor to sloughing. Land managers will need to work on measures to reduce sloughing.

Some potential exists to provide additional interpretation of geologic and natural features in the planning area, particularly on lands managed by federal or state agencies. No specific plans are known at this time. Public scoping meetings have indicated the public would like more interpretation of the Bonneville flood's influence on the formation of the canyon.

## **CULTURAL RESOURCES**

Management of cultural resources by federal agencies will focus on preservation and protection of sites. Activities may entail excavation of sites, maintenance and stabilization to prevent further deterioration, expansion of ranger patrol, and implementation of a volunteer informant program to monitor site disturbance.

As part of the Oregon Trail sesquicentennial (150th year) celebration, planned activities for the Middle Snake area include additional interpretive signage at the Pilgrim Stage Stop and other Trail sites, signage on State Highway 30 and Interstate 84 for an auto tour route directing travellers to important Trail sites, and a trail ride stopping at campsites along the way including Kanaka Rapids and an area above Hagerman.

A backcountry byway is proposed by the BLM as part of the interpretation of the Oregon Trail. The purpose is to promote the recreational opportunities of the trail and give individuals an opportunity to traverse sections of the original trail and view significant sites. An exact route has not been identified to date (Jenks, 1992).

Several hydro project proposals in the planning area will result in additional cultural resource surveys of the reach, and if warranted, detailed excavation and examination of sites. At a minimum, cultural sites will be identified and documented as part of the environmental study required to submit an application to the FERC. If any of these projects are licensed, additional cultural resource opportunities may occur as part of project mitigation.

The National Park Service is investigating the feasibility of designating a National Register District from Milner Dam to approximately Murtaugh bridge. This designation may result in additional interpretation of sites in this reach.

## RECREATION

Several developed recreation facilities are mapped out for the planning area. Projects are the result of recreation mitigation for proposed hydropower projects, recommendations in agency management plans, or commercial endeavors by private enterprise.

Several recreation development proposals are associated with hydropower project mitigation plans submitted to the FERC. Idaho Power Company will enhance overlooks and improve park facilities at Twin and Shoshone Falls. The Power Company is also building a boat access at Milner Bridge and at the Main Milner Powerhouse. Recreation mitigation for the licensed Auger Falls hydro project will include a trail system for hiking, equestrian use, and bicycling. The trail will consist of a loop around the perimeter of the project site with side trails, including a trail paralleling the river.

If hydropower projects are built at Boulder and Kanaka rapids, picnic areas, trails, wildlife/rapid viewing areas, and fishing access are contemplated. At Empire Rapids, provision of public access for fishermen, hikers, and sightseers is suggested (Don Chapman Consultants, Inc., 1992). Realignment of the Clear Lakes Grade will include a pull-out at the Clear Lakes Bridge to allow access to the Snake River near Empire Rapids (Thomas, 1992). A hydropower project proposed at Star Falls plans on providing improved road and trail access to the falls, a boat ramp, interpretive facilities, and viewpoints on the north and south canyon rims (B & C Energy, Inc., 1992).

Federal, county and city agencies have plans to provide additional recreation facilities in the planning area. The Burley District BLM is acquiring access for a trail from the south rim into the canyon just west of Twin Falls, where an unimproved trail currently exists. The BLM would develop the trail for hiking use only (Boggs, 1992). The Shoshone District is considering a trail along the rim north of Twin Falls, and a rest stop/picnic area at Hansen Bridge (Sharp, 1992). Other development considerations include expanded facilities at the Bliss Bridge boat take-out, and a take-out in the King Hill area (Ridenhour, 1992). Plans to proceed with proposals in the Bennett Hills Resource Area will not occur unless recommended in the final Resource Management Plan (Sharp, 1992).

Several recreation studies indicate the planning area is ideally situated to attract additional tourism. Recreation trend studies reveal Americans have less leisure time and are taking more, but shorter, trips closer to home (Cordell et al., 1990). This trend suggests that the population bases of

Boise, Pocatello, Idaho Falls, Wood River Valley, and Salt Lake City, all within a day or weekend trip from the planning area, are a ready market for the tourism industry. Whitewater boating currently attracts people from these areas.

The Twin Falls Chamber of Commerce reports more non-resident vehicles pass through the intersection of I-84 and U.S. 93 than any other intersection in Idaho (Twin Falls Chamber of Commerce, 1992). These characteristics suggest there is a ready market passing through the planning area. By focusing marketing attention on travellers passing through additional economic growth in the tourism market may be realized.

The National Park Service is currently preparing a management plan, expected to be available for public review in early 1993, for the Hagerman Fossil Beds National Monument. Erosion and slumping problems will likely limit the degree of developed facilities within the monument itself. A number of sites across the river from the monument are currently being evaluated for possible location of a research/visitor center. Other potential development on the Monument might include trails for guided and self-guided tours, and picnic areas (King, 1992). As a result of the National Monument designation there will likely be additional development by private enterprises to capitalize on tourist traffic attracted to the Hagerman area.

Twin Falls County has several proposals for future recreational developments. Phase two of Centennial Park, located in the canyon to the west of the Perrine Bridge, was recently completed. Other phases will be completed in the future with the addition of picnic areas and trails. Trails linking the park to Rock Creek and Pillar Falls are envisioned. Other county proposals, cited in planning documents but not currently being pursued, include a park for off-road vehicle use and a boat ramp and picnic area in the Thousand Springs area (Heider, 1992).

The City of Buhl plans to build a visitor center in town to direct tourists to nearby recreation attractions (Ramsey, 1992). The City of Twin Falls has plans to expand and improve facilities at Dierkes Lake Park located above Shoshone Falls. Plans include improved hiking trails, interpretive programs for the geology, hydrology, and ecology of the area, an arboretum of native and non-native trees and shrubs, and renovating of walkways (Twin Fall Chamber of Commerce, 1992).

## **IRRIGATION**

Approximately 50 percent of the arable land within Gooding, Jerome, and Twin Falls counties is presently irrigated. Most of the potentially irrigable land is in Twin Falls County (Gooding County - 97% of arable acreage irrigated; Jerome County - 80% irrigated; Twin Falls County - 43% irrigated). A significant amount of the Twin Falls acreage lies within the Salmon River Canal

Company tract, south of the Twin Falls High Line canal. Potentially irrigable lands in Gooding and Jerome counties are generally located north of the North Side tract.

Outside of the Salmon Falls tract, irrigated lands are well supplied with water, since irrigators adjacent to the Middle Snake reach have good natural flow rights and own much of the Upper Snake storage. Virtually all private land in the planning region has been developed. The remaining potentially irrigable lands in the area are in federal ownership and additional development is dependent upon governmental policy regarding public land retention or disposal. Additionally, some potentially irrigable land remains undeveloped because the financial returns are not great enough to attract the necessary capital to develop it.

Water available for new irrigation, from diversion of the Snake River above the Murphy gage, is limited. New irrigation is dependent upon development of a water supply either by ground-water pumping, new storage construction, or purchase of existing upstream water rights, and the construction of the facilities necessary to transport the water to the new lands.

Designation of portions of the Middle Snake reach as "Water Quality Limited" imposed a moratorium on expansion or new development subject to a Total Maximum Daily Load (TMDL) determination. New diversions could further impact the water quality of the reach by reducing the dilutive capacity of the river.

To forestall federal regulation, irrigators in the Middle Snake region will be pressed to improve the water quality of return flows, primarily through development and implementation of new sediment control methods. Toward this end, canal companies are working with the Idaho Division of Environmental Quality in developing a comprehensive water quality improvement program for the Middle Snake reach.

## **LIVESTOCK OPERATIONS**

The Shoshone District BLM is currently considering eliminating livestock grazing below the canyon rim on the north side of the river. This change is being evaluated as part of the Bennett Hills Resource Management Plan. The action would not be implemented until the final plan was completed and a Record of Decision signed (Barnum, 1992).

The dairy industry has expanded rapidly over the last few years in the Middle Snake region, and shows indications of continued growth. In 1990, Gooding, Jerome, and Twin Falls counties contained 40 percent of the state's milk cows. An additional 45,000 milk cows are expected to be



brought to the area to produce the milk necessary for cheese production at the plants in the area (Twin Falls Chamber of Commerce, 1992).

## AQUACULTURE

Aquaculture is a world-wide growth industry. The forces contributing to this growth are diminished natural fisheries, higher production costs for natural fisheries, increased demand for fish protein, and a growing population. Currently, the United States imports 60 percent of its food fish supplies. The major factors influencing the future growth of the food fish industry are marketing practices, increasing production costs, water resources development, and discharge effluent requirements.

Growth of the local aquaculture industry may be constrained by the availability of new water sources, since most water supplies are now fully utilized. Increases in production must rely on more efficient use of existing water supplies. Extending the use of water further will require oxygen supplementation. Water recirculation systems have not yet proven economical. Advancements in water-reuse technology need to be implemented if farms constrained by their present water supplies are to continue to grow.

The industry is concerned with a reduction in spring flows. Spring flows in the Middle Snake reach show a steady decline in discharge since the mid-1950s. The drought (1987-1992) has exacerbated this decline. Current average spring discharge is 5,700 cfs, down from a peak of 6,800 cfs in the early 1950s. Declining flows are attributed to ground-water pumping, reduced irrigation recharge, and the drought (Kjelstrom, 1986; 1992; Brockway, 1992).

If spring flows continue to decline, a hardship could befall the aquaculture industry in this area. Hatcheries dependent on southside seep tunnels or canals are already experiencing extreme water supply variability relative to climate and irrigation practices. Fish farms have been operating along the reach since the late 1920s and, because of the available water, have increased in number. If current flow is further reduced, approximately one-third of the facilities could be forced out of business or into capital outlay to recycle or pump water (Klontz and King, 1975).

Designation of portions of the Middle Snake reach as "Water Quality Limited" imposed a moratorium on expansion or new development subject to a 401 certification, and a Total Maximum Daily Load (TMDL) determination. Certification is currently limited by a "no net increase" provision. Waste disposal will face tighter controls in coming years, which will pressure producers to reduce waste as much as possible or to develop new disposal methods. The industry is currently

working with the Idaho Division of Environmental Quality in developing a comprehensive water quality improvement program for the Middle Snake reach.

The aquaculture industry is also concerned about the water quality of the springs. Vegetative build-up on raceway head screens and nitrate levels in spring flows are concerns. High quality water is critical to production potential per unit of flow (Klontz and King, 1975).

## **DOMESTIC, COMMERCIAL, MUNICIPAL, AND INDUSTRIAL WATER USES**

The demand for domestic, commercial, municipal, and industrial water is increasing due to population growth and an increase in the per capita use of water. Idaho per capita use averages 311 gallons per day (USGS, 1990). The combined population of Gooding, Jerome, and Twin Falls counties has increased 27 percent in the thirty years between 1960 and 1990. The cities, which are the fastest growing areas, may require new water supplies to provide for additional people. As the industrial potential of the area is developed, water requirements for industrial use will also increase.

Many communities need to expand and upgrade their systems, and all systems must meet the new, stringent standards imposed by the Safe Drinking Water Act. Improvements cover a wide range of facilities, but they consist mainly of new wells, storage tanks, and pipelines. Some communities have paid for these improvements without outside help, but most have made use of public funding programs. Funding for drinking water improvement may be available from the Idaho Water Resource Board's Revolving Development Account or Water Management Account, and the Rural Development Program of the U.S. Farmers Home Administration (Idaho Department of Commerce). The state agency responsible for regulating and monitoring public drinking water systems is the Division of Environmental Quality.

The use of water in homes and industry involves disposal as well as supply. Only a small percentage of water used for domestic and industrial purposes is incorporated into products or evaporated into the air as water vapor. Most of the water is returned to streams or permitted to infiltrate the ground, from where it percolates toward streams and aquifers. Water thus can be reused many times, but dissolved solids, suspended material, and bacteria may contaminate the water with each use.

## **MINING**

Gold and a variety of industrial minerals are present in the Middle Snake region (Appendix B: Area Overview and Resource Summary). Future development of the mineral resources is dependent on mining technology, material grade, and markets.

**Gold** - Gold worth millions of dollars is thought to remain in the Snake River and on its banks, however, the very fine, flat flakes makes it extremely difficult to recover. It can take up to 500,000 individual flakes to equal one ounce (Wojchik, 1992). There are numerous higher grade gold deposits, hardrock and placer, elsewhere in Idaho and the United States (Gillerman, 1992).

**Diatomite** - California has been the leading producer of diatomite since 1910. Despite the presence of a number of diatomite deposits, Idaho has produced only nominal amounts -- an estimated 3,000 tons from 1930 through 1960 (U.S. Bureau of Mines, 1991; Idaho Bureau of Mines and Geology, 1964). Currently there is no production in Idaho. U.S. reserves and production capabilities are very large, markets are well satisfied, and competition among producers is high. Because of the high competitiveness of the diatomite industry and the substantial start-up costs for a new mine, displacing present suppliers would be difficult. In addition, problems might be expected in meeting stringent standards for diatomite products and high transportation costs (U.S. Bureau of Mines, 1991).

**Clay** - Because the cost involved in shipping heavy-clay products is high, only local clay deposits can be used economically. The supply of raw clay for clay products now produced in Idaho is more than adequate for the needs of the immediate future. Resources of common clay are virtually inexhaustible, although depletion of local pits or a change in consumer requirements could result in periodic modification of the raw materials used for clay products.

**Pumice, Sand, and Gravel** - Due to transportation costs, any future development will be limited to local markets. With its high bulk and relatively low value, sand and gravel is generally excavated as near to its site of use as possible to keep transportation costs low.

**Dimension Stone** - The outlook for expansion of Idaho's dimension stone industry is fair. However, future development of deposits in Idaho will continue to be limited by a small local market, remoteness from other markets and prohibitive transportation costs. Because dimension stone is used predominantly for ornamental purposes, it is a luxury item and subject to downturns in the economy.

## **POWER DEVELOPMENT AND ENERGY CONSERVATION**

The four major electric utilities serving the state of Idaho are projecting moderate growth in both peak demand and energy usage over the next 20 years. The projected average annual growth in peak demand is 1.47%, 1.15%, 0.92%, and 1.2% for Idaho Power Company, Washington Water Power, Utah Power and Light, and Pacific Power and Light, respectively (IPUC, 1992).

The projected average annual growth in energy sales is 1.3%, 0.88%, 0.98%, and 1.16% for Idaho Power Company, Washington Water Power, Utah Power and Light, and Pacific Power and

Light, respectively (IPUC, 1992). Idaho's investor-owned utilities continue to forecast growth rates which cluster around the median of growth scenarios of the regional planning bodies. The joint Bonneville Power Administration - Northwest Power Planning Council forecast which forms the basis for the 1991 Power Plan, portrays a broad range of growth. Emphasis is placed on potential loads falling between the medium-high growth rate of 1.6 percent and the medium-low rate of 0.5 percent. Idaho's utilities fall within this range.

Planned acquisitions of non-deferrable resources are expected to meet Idaho Power Company's needs for new resources for the next twelve to twenty years (IPC, 1991a). These resources include generation system efficiency improvements (42 aMW), completion of hydropower projects now in progress (55 aMW), cost effective new conservation programs (110 aMW), and the purchase of cogeneration and small power production from qualifying facilities at avoided cost rates (116 aMW)(IPC, 1991a). A power supply deficit caused by drought or salmon flow enhancement programs would be filled by non-renewables because the region may lack the infrastructure and financial commitment to implement more complex conservation and renewable actions.

### *Conservation Resources*

Conservation programs can provide both capacity and energy savings. Capacity is the ability to supply power, and energy is power supplied. Some conservation programs reduce load only during off-peak hours while others provide load reduction primarily during peak hours and therefore provide substantial capacity savings. The current system requires energy, not additional capacity, and conservation options are designed for the purchase of energy savings (IPC, 1991b).

About 60 percent of residential conservation is available from reducing the energy required to heat homes, both existing and new (NPPC, 1991). In conjunction with utility marketing and incentive programs, energy codes, based on governmental regulatory authority, are the best means for achieving savings in new buildings. For new homes, Idaho has adopted model conservation standards.

Office buildings and retail stores consume about 50 percent of the electricity used in the commercial sector, and space heating, space cooling, and lighting are the dominant end-uses (NPPC, 1991). In the industrial sector, energy savings identified by industrial plant managers, are associated with motors, motor controls, lighting, and other plant equipment. Potential energy savings in the irrigation sector are from the use of more efficient water application systems and irrigation scheduling improvements for both new and existing acreage.

Potential energy savings in agriculture can contribute additional generation potential by conserving water within the hydropower system. Energy used for irrigation pumping accounts for about 7 percent of the total energy generated by Reclamation hydroelectric plants (USBR, 1991).

Approximately 224 average megawatts of potential savings have been identified within the Idaho Power customer service area under the base case load forecast. This figure represents the potential savings which could be achieved with complete implementation of current cost-effective technology (IPC, 1991b). The average cost of deferrable conservation measures is estimated to be approximately 3 cents/kwh (IPC, 1989).

### *New Hydroelectric Development*

The Northwest Power Planning Council estimates that about 410 average megawatts of firm energy may be available from new hydropower development that is cost-effective and not precluded by stream reach protection designations. This potential includes retrofits at irrigation, flood control, and other nonpower water projects; additional generation equipment at existing hydroelectric projects; and construction of new projects at undeveloped sites (Maps: Proposed and Existing Hydropower Sites - State of Idaho; Dams having hydropower potential that do not generate power - State of Idaho). Upgrading hydroelectric generator and turbine units at existing powerplants is one of the most immediate, cost-effective, and acceptable means for developing additional electrical power. It is possible to retrofit many of the older projects using advanced designs, materials, and equipment.

Proposed projects on the Middle Snake reach could add a potential capacity of 230 megawatts. Hydropower projects proposed for the Snake River in the Middle Snake reach include: Star Falls, Auger Falls, Boulder Rapids, Empire Rapids, Kanaka Rapids, A.J. Wiley, and Dike (Map: Hydropower Sites - Middle Snake Reach). Project descriptions are provided in Appendix B: Area Overview and Resource Summary.

Idaho Power, in conjunction with the Northside and Twin Falls Canal companies, has added power generating facilities at Milner Dam and constructed a second power house 1.6 miles downstream. The Company is significantly increasing the generating capacity of their Twin Falls and Upper Salmon Falls facilities, and proposes to upgrade their project at Shoshone Falls. Generating capacity at Twin Falls will go from 10 MW to 52 MW, Upper Salmon will increase capacity from 34.5 MW to 48 MW, and the potential at Shoshone could add up to 119 MW (Sipe, 1992).

Southern Idaho has an extensive canal system for the distribution of irrigation water. The canals provide low-head hydro potential for electric generation with minimal environmental degradation. Idaho Power Company estimates that approximately 150 average megawatts of summer

power generation can be developed at canal hydro sites in southern Idaho, with annual average generation of approximately 75 megawatts. The summer seasonality of canal hydro generation complements the winter seasonality of generation from the Milner project (IPC, 1989).

### *Other Power Sources*

A drop in residential electricity demand for space and water heating can be expected from a switch to natural gas. The relative price gap between gas and electricity is now large. NPPC projections show that relative price gap remaining quite large through their forecast period (IPUC, 1991). It can be expected that gas, if available, will be used in most new homes, and many older home heating systems will be switched to gas.

Cogeneration is a well-established technology involving the sequential production of electricity and thermal energy. Cogeneration projects, using exhaust heat from food processing plants in the Snake River Plain, could generate as much as 150 megawatts. The thermal energy produced in cogeneration may be used for industrial process heating, space heating, hot water heating, and absorption chiller loads. Since the thermal energy offers value that can offset part of the cost of fuel and equipment, the electrical energy produced can be generated at less cost than electricity produced alone using comparable equipment and fuel.

Municipalities have found opportunities for recovering energy in the incineration of solid wastes to produce steam and electricity and the digestion of sewage to produce methane gas. Recent experiences have also shown the potential of recovering methane gas from completed or abandoned landfills. Energy recovery from these processes can displace conventional sources of fuel, while reducing costs and environmental problems associated with traditional waste disposal. Factors which may limit the utilization of these wastes for energy production include the community's population, per capita waste generated, and the availability and cost of alternative disposal methods.

Geothermal, wind, and solar energy are among Idaho's most promising renewable resources, but their future is obscured by technical, environmental, and institutional obstacles. Geothermal resources have been suggested for power development in the region. However, subsurface temperatures in the area are below temperatures for potential power generation (Mitchell et al., 1980). The greatest potential, as far as present knowledge of the resource in Idaho is concerned, is for space heating and greenhouse use.

While wind farms are common in California, the Northwest has little satisfactory experience with this resource. However, wind, in locations, is becoming viable (Fuhrman, 1992). Southern Idaho has several potential wind-generation sites. Annual technical potential at the sites is estimated

at 100 average megawatts. The estimated cost of energy from these sites ranges from 12.6 to 21 cents/kwh (NPPC, 1991).

Solar's cost is continuing to decrease, and the performance of the technologies is improving. Solar insolation ratings indicate that southern Idaho is a good location for solar-powered electricity generation. Idaho Power Company recently joined the Solar Two project in California, a solar energy demonstration effort. The solar-thermal plant will use a molten-salt heat transfer and storage system. Solar-thermal plants may produce electricity at a cost competitive with coal generation, without the environmental impacts or fuel costs associated with fossil-fueled power plants. Solar Two experiments could lead to sales of solar produced electricity from the facility by the year 1998 (NEN, 1992a).

Solar-thermal power plants are heat engines and therefore require water for condenser cooling. Solar-thermal plant efficiencies are similar to, or less than fossil-fueled power plants, and therefore require similar or slightly more water for comparable power production. Water requirements can be reduced by use of dry cooling systems (NPPC, 1991).

Photovoltaic (PV) costs have dropped enormously in the past 20 years, to the point that they are often cheaper than diesel generator sets and utility line extensions. PV's are not presently price competitive with utility power in most areas, but that too will likely change in the future. Projected improvement targets are to lower the cost to 8.5 cents/kwh by 2010 (NPPC, 1991). At that price, photovoltaics clearly will be cost-competitive with other sources of energy. While utility-scale photovoltaics are not yet practical, at least in Idaho, small remote applications are effective.

## **WATER RESOURCES**

Energy and water conservation are closely tied; less water used means that less water has to be pumped, resulting in lower energy needs. Withdrawing less water from a reservoir increases the operating head and energy production of a powerplant. Modifications to water scheduling and operation can reduce peak demands, thereby reducing peak capacity needs for both water and energy.

### ***Conservation and Drought Management***

The Palmer Drought Index shows that a meteorological drought has existed in the State during one-third of the period from 1931 through 1982 (Karl et al., 1983; IWRB, 1968). The drought index treats drought severity as a function of accumulated weighted differences between actual precipitation and the precipitation requirement. The precipitation requirement is derived from consideration of temperature and soil moisture.

In light of the probability of drought recurrence, water conservation is crucial to continued reliance on the State's water supplies and to future development. Water conservation measures could save water, control erosion, and reduce pollution in the Snake River and tributary streams.

Water conservation may be examined as an alternative or a supplement to traditional water supply facility proposals. Water conservation may be pursued through demand reduction, by using the existing supply more efficiently, and/or increasing water supplies by operating storage and delivery facilities more efficiently. Structural and non-structural measures apply to each. Although water supplies in the region are generally plentiful, shortages already occur during droughts. In the Middle Snake planning region, water conservation applies principally to irrigation, since irrigation is the primary consumptive use.

Improved management or technology in the delivery and application of water can result in greater efficiency in irrigation water use. Farm operators and delivery organizations are directly concerned with undertaking such improvements, particularly with current drought conditions. There is a significant trend at the farm level toward the adoption of water conserving improvements such as leveling of fields, use of gated pipe, sprinklers, or drip systems, and lining of ditches. Studies by the Soil Conservation Service in the Upper Snake basin, in cooperation with the Bureau of Reclamation, indicate that the farm net irrigation requirement may have been reduced by up to 50 percent over the last decade (Wilton, 1992).

Opportunities to reduce operational costs or to increase delivery reliability provide important water use efficiency incentives at the organization level. Conveyance system losses account for approximately 30 percent of diversions (U.S. SCS, 1977; Wilton, 1992). Open channel irrigation systems with fixed delivery rates, schedules, and long lag times between diversion and delivery are conducive to large operational wastes and inefficient utilization of water. Distribution systems must be able to respond to on-farm water use demands to enhance water-use efficiency.

The Drought Assistance Act of 1988 directed the Secretary of the Interior to identify opportunities to conserve water supplies. The Bureau of Reclamation and the Northside Canal Company are embarking on a demonstration study of water efficiency measures that could have potential for making water available for other uses (Golus, 1992).

A lack of compensation for the implementation of conservation measures is a disincentive to more efficient water use in the State of Idaho. Additionally, the adverse effects of improvements in water-use efficiency are difficult to trace and prevent, regardless of legal provisions. Conservation of irrigation water may lead to a reduction in aquifer recharge or return flow to a stream which provides water for other uses.



## GROWTH

Although economic activity has certainly improved in the state, it now appears that the state's pace of economic activity will slacken somewhat, and be more reflective of national trends. Local areas of the state are expected to experience very strong growth for the foreseeable future, while other areas are enduring long-term restructuring or decline.

Communities in the planning area are beginning to deal with growth issues. Issues have focused on the ability of the community to deal with increased demands for services associated with a rapidly growing population, the methods of funding these services, and the effects that growth is having on the character and livability of the community. Several studies have shown that the cost per resident of providing various public services increases with population (Gardner, 1979; Weinstein and Firestone, 1978, both cited in Power, 1988). The larger a local economy becomes, the more sophisticated the range of local public services that the local population demands. This tends to boost the level of taxes needed per capita since a greater variety of services is called for.

## V. ALTERNATIVE ANALYSES

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### Alternatives

River segments with identified Outstanding resource values were assessed for State protection through six alternatives encompassing development, improvement, and the conservation of resources. All segments of the Middle Snake reach, with the exception of Bliss Reservoir, were found to possess at least one, and usually two or more, "Outstanding" classifications for either fish and wildlife, geologic features, scenic values, or recreation, as defined by criteria in Section III. The segments identified as eligible for protection based on the screening process were further refined by overlay of a land use map.

Those segments possessing little or no cultural modification were analyzed for potential designation as a Natural river. Idaho Code, Section 42 -1731, defines a Natural River as a waterway possessing the following characteristics: (a) outstanding fish and wildlife, recreation, geologic or aesthetic values; (b) free of substantial existing man-made impoundments, dams or other structures; and (c) riparian areas are largely undeveloped, although accessible in places by trails and roads. A Recreational River is defined as a waterway having the following characteristics: (a) outstanding fish and wildlife, recreation, geologic or aesthetic values; and (b) might include some man-made development within the waterway or within the riparian area of the waterway.